At section 2, claims 1, 5-10 and 12 -20 are rejected under 35 U.S.C. 102(b) as being anticipated by *Fujii et al.* (WO 02/080299, hereafter referred to as *Fujii*).

In rejecting these claims, the Examiner states that *Fujii* discloses a fuel cell comprising a planar substrate 11 having a plurality of apertures 16 with a plurality of membrane electrode assembly segments 12/13/14 securely attached on the apertures 16.

Applicant respectfully disagrees.

Fujii discloses a fuel cell made by a semiconductor process (see Abstract). As shown in Figure 1, the fuel cell has a substrate 11 with a plurality of openings 16, and an MEA is formed so as to cover each of the openings. The MEA comprises a laminate of a first catalyst electrode 12, a hydrogen ion conductive polymer thin-film membrane 13 and a second catalyst electrode layer 14 (col.5, lines 11-17). Functionally, the MEA 12/13/14, according to *Fujii*, is equivalent to the MEA segment 110 of the present invention; the membrane 13 is equivalent to the PEM 120; and first catalyst electrode 12 and the second catalyst electrode 14 is equivalent to the first and second activation layers 112 and 114 of the claimed invention.

However,the claimed invention is distinguishable over *Fujii* in that the MEA segment of the claimed invention is securely attached to the aperture, whereas the MEA in *Fujii* is formed in a number of separate processes. According to *Fujii*, the first catalyst electrode layer 12 is formed on the front surface of the Si substrate by a sputtering process (col.5, lines 35-37) and then the membrane 13 is formed by a spin coating process (col.5, lines 44-54). Subsequently, the second catalyst electrode layer 14 is formed by a sputtering process (col.5, lines 55-57). After the formation of these layers, the Si substrate is etched to form the openings 16 (col.5, line 63-66).

Accordingly, *Fujii* fails to disclose securely attaching a plurality of membrane electrode assembly segments to the substrate over the apertures, each membrane electrode assembly segment comprising a proton-exchange membrane sandwiched between two activation layers, wherein each membrane electrode assembly segment has a first side and an opposing second side, the second side adjacent to the second cell compartment, the first side adjacent to the first cell compartment for activating the

reactant in order to produce the protons and for channeling at least part of the protons from the first cell compartment to the second cell compartment via the apertures through the membrane electrode assembly segments

For the above reasons, *Fujii* fails to anticipate claims 1, 5-10 and 12 –20.

At section 4, claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over *Fujii*, in view of *Nagayama* (JP11045729A). The Examiner cites *Nagayama* for disclosing a hot melt layer for adhering various layers in a fuel cell. The Examiner states that it would be obvious for a person skilled in the art to combine the teachings of *Fujii* and *Nagayama* to come up with the invention of claim 2. Applicant respectfully disagrees.

The MEA, according to *Fujii*, is formed on a Si substrate before the Si substrate is etched to form openings. In particular, according to *Fujii*, the first catalyst electrode layer 12 is formed on the front surface of the Si substrate by a sputtering process (col.5, lines 35-37) and then the membrane 13 is formed by a spin coating process (col.5, lines 44-54). Subsequently, the second catalyst electrode layer 14 is formed by a sputtering process (col.5, lines 55-57). After the formation of these layers, the Si substrate is etched to form the openings 16 (col.5, line 63-66). In the layer forming processes, according to *Fujii*, it is not useful or even possible to use a hot melt material to adhere an MEA to a substrate with the openings, because the separate layers are formed in a sputtering process or a spin coating process on a Si substrate.

For the above reasons, *Fujii*, in view of *Nagayama*, fails to render claim 2 obvious. Furthermore, claim 2 is dependent from claim 1 and recites features not recited in claim 1. For reasons regarding claim 1 above, claim 2 is also distinguishable over the cited *Fujii* and *Nagayama* references, whether they are used individually or in combination.

At section 4, claims 3 and 4 are rejected under 35 U.S.C. 103(a) as being unpatentable over *Fujii*, in view of *Morse* (U.S. Patent No. 6,960,403) or *Arroyo* (U.S. Patent Application Publication No. 2005/0019635). The Examiner cites *Morse* and *Arroyo* for disclosing sealing a micro-scale fuel cell between adjacent substrates wherein the sealing

is provided to prevent reactant crossover between the anode and cathode. The Examiner states that it would be obvious for a person skilled in the art to combine the teachings of *Fujii* and *Morse* or *Arroyo* to come up with the invention of claims 3 and 4. Applicant respectfully disagrees.

Claims 3 and claim 4 are dependent from claim 1 and have the further limitation that the attaching is achieving by applying an adhesive layer between the substrate and the MEA segment. As with claim 2 above, it is not useful or even possible to apply an adhesive layer between the substrate and the MEA in those semiconductor processes, according to *Fujii*.

For the above reasons, *Fujii*, in view of *Morse* or *Arroyo*, fails to render claims 3 and 4 obvious.

At section 5, claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over *Fujii*, in view of *Pratt* (U.S. Patent No. 6,127,058). The Examiner cites *Pratt* for disclosing diffusing layers over the electrodes. The Examiner states that the diffusing layers are usually comprised of woven carbon fiber cloth or porous carbon paper, and, in practice, the diffusion layer can be integrated with the electrodes. Applicant respectfully disagrees.

Diffusing layers such as those made of woven carbon filter cloth or porous carbon paper cannot be integrated with the first and second catalyst electrode layers in a semiconductor process, according to *Fujii*. According to *Fujii*, the first catalyst electrode layer 12 is formed on the front surface of the Si substrate by a sputtering process (col.5, lines 35-37) and then the membrane 13 is formed by a spin coating process (col.5, lines 44-54). Subsequently, the second catalyst electrode layer 14 is formed by a sputtering process (col.5, lines 55-57). After the formation of these layers, the Si substrate is etched to form the openings 16 (col.5, line 63-66). In particular, the Si substrate is etched with a 30 to 50 vol% of KOH aqueous solution having been heated to 80°C to form the openings. In the layer forming processes on a Si substrate, according to *Fujii*, it is not useful or even possible to produce the diffusing layers as suggested by the Examiner.

For the above reason, *Fujii*, in view of *Pratt*, fails to render claim 11 obvious.

Furthermore, claim 11 is dependent from claim 5 and recited features not recited in claim 5. For reasons regarding claim 5 above, claim 11 is distinguishable over the cited *Fujii* and *Pratt* references, whether used individually or in combination.

At section 6, claims 18-20 are alternatively rejected under 35 U.S.C. 103(a) as being unpatentable over *Fujii*, in view of *Mardilovich* (U.S. Patent No. 7,033,691).

At section 7, claim 21 is rejected under 35 U.S.C. 103(a) as being unpatentable over Fujii, in view of *Mardilovich*.

The Examiner cites *Mardilovich* for disclosing a notebook computer, a laptop computer, a tablet computer and a personal digital assistant device.

It is respectfully submitted that claims 18-21 are dependent from claim 17 and recite features not recited in claim 17. For reasons regarding claim 17 above, claims 18-21 are also distinguishable over the cited *Fujii* and *Mardilovich*, whether used individually or in combination.

CONCLUSION

Claims 1-21 are allowable. Early allowance of all pending claims is earnestly solicited.

Respectfully submitted,

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